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AUTHOR Hu, Nan Brian
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ABSTRACT

This study examined some factors influencing college students' choice of field of study. A model of student choice of major focused on students' perceptions of labor market conditions, personality development, college campus experience of academic and social integration, and use of information available on campus was established. The issues examined were the significance of perceptions of market variables, the use and acquisition of information for choice of major, and the timing of choice decisions. A mail survey was conducted of college juniors and seniors attending a comprehensive research university; 573 students responded. The dependent variable was student choice of any of eight majors. The main independent variables were student perceptions of labor market variables such as salary, job opportunities, job advancement, and other variables. Other aspects investigated in relation to choice of major were effects of socioeconomic background, gender, and race; student intent to achieve the degree and continue for graduate studies; use of information in selecting the major; and timing of students' final decisions regarding majors. The study found that labor market perceptions combined with different personality orientations accounted for 77.5 percent of the total variance in student choice of majors. Nineteen tables containing details of factors analyzed are included. (Contains 7 figures and 36 references.) (CK)

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Effects of College Students' Perceptions of Labor Market Variables and Conditions on Their Choice of Academic Majors

Nan Brian Hu, Ed. D.
Assistant to the Dean and
Coordinator of Academic Administration

Office of Academic Affairs
Hostos Community College
500 Grand Concourse, B-447
Bronx, NY 10451

Tel: (718) 518-6639
Fax: (718) 518-6659
E-mail: bhnho@cunyvm.cuny.edu

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Jean Endo
Editor
AIR Forum Publications

Abstract

This study has established a model of student choice of academic major with the student's perceptions of labor market variables/conditions, personality development, college campus experience of academic integration and social integration, and use of information available on the campus with the increased ability of decision making in studies, etc. It reveals that the student perceptions of labor market variables and personality orientation are statistically significant factors affecting choice of major, which have also generated four types of choices among eight majors under study: the high job opportunity and high people-oriented personality, the high job opportunity and high salary, the high salary and high intellectual-oriented personality, and high intellectual-oriented personality and high people-oriented personality. Choice of major may be regarded as a social behavior rather than a personal behavior.

Effects of College Students' Perceptions of Labor Market Variables/Conditions on Their Choice of Academic Majors

This study examines some factors that influence the college students' choice of academic majors, especially, students' perceptions of labor market variables/conditions and personality orientation. College Student Choice of Major is an important aspect in student career development and human capital investment. Since a college education engages a person in the pursuit of a better living, fulfilling personal goals and values, and getting a satisfactory job, the right choice can lead to success in one's investment in higher education and promote the desire for learning and academic achievements. Student Choice of Major is related to the student's perceptions of the labor market in that the pursuit of a job or a career depends on how a person perceives its advantages, disadvantages and benefits. Such perceptions may greatly influence the choice of academic majors and fields of study that students choose. In return, students' choice of academic majors may have considerable impact on enrollment management, program offerings and student retention.

Obviously, a job with better and attractive entry-level and life-time salaries and benefits as well as better job advancement opportunities is more often than not the right target for a person to pursue, especially for a college graduate. As Gissker (1987:25) points out, "Credentialism is not only being fostered by employers, but is encouraged by students and consumers of education.... Students increasingly use education as a hedge against unemployment or low-status employment." Labor market variables do reflect major factors that students are apt to examine when choosing a career.

Rationale

Student Choice of Major has a considerable impact on enrollment management, program offerings and, especially, student persistence/attrition in that a right choice may lead to success, and a bad one to failure or dropout. It may eventually determine the continued existence of certain academic programs and higher educational institutions, both public and private.

Furthermore, Student Choice of Major is an issue of decision making. To know how students acquire information and what information is factored in their decision making is important, since acquisition and use of appropriate, accurate, realistic and adequate information should result in a better choice, which may lead to higher rates of academic success and retention.

Although a large number of studies on Student College Choice have revealed several important factors affecting Student College Choice, there are some basic differences between Student College Choice and Choice of Major. First, Student Choice of Major and degree attainment are the consequences of College Choice. Secondly, Choice of Major is more specific than College Choice in terms of career development. Finally, Research on Student College Choice has mainly concentrated on college choices of high school graduates (Stage and Hossler, 1989; Litten *et al* 1983; and Manski and Wise, 1983). The major reason of this may be that College Choice is often regarded as a social issue such as equal educational opportunity, whereas Choice of Major has been regarded as an issue of the student's personal preference.

Bosworth and Ford's (1985) study has demonstrated that many college freshmen do not enter with specific careers in mind. How students choose their majors and why they chose them are still largely unanswered questions for most higher education administrators. As a result, they often don't know how to help students in their career choices without adequately understanding its process. Because of the unavailability of adequate information and effective help, many students may have difficulty in determining their majors. Some students, even after graduating with a degree, may still be uncertain about their careers. This can be seen as a great waste of resources and time for both the individual and the institution. Furthermore, the lack of research on college students leaves administrators and professors with inadequate information to deal with students who are supposed to be treated as both consumers and investors in higher education.

Choice of Major is related to the labor market in terms of the student's perceptions of the market values of a particular major. Levin (1991:137) delineates the relationship between choice and market economy, stating that "choice is one of the major tenets of both a market economy and a democratic society." In a market economy choice means competition and competence, which may lead to the development of individual potential, economic productivity and the

performance of important social roles. Student Choice of Major is an act of matching and combining individual goals with social roles.

School environment and college experience foster students' Choice of Majors, as they provide students with more opportunities to gain necessary skills for critical thinking, problem-solving and decision-making, more adequate information for career decisions, and more interaction with the real world. College experience enables students to gradually realize their own values and potential to fit in particular living styles and socioeconomic roles. As Knirnick and Kempner (1988:299) point out, many studies have shown that "attaining the Baccalaureate Degree (B.A.) is influenced by the kind of college first attended after high school". Studies of student retention/attrition (Tinto, 1974, 1987; Beans, 1983, 1985; Pascarella and Terenzini, 1986 and Cabrera et al, 1990) have also provided considerable evidence that student persistence and attrition largely depends upon the student's commitments to goals, academic integration, social integration and financial "ability to pay" through the interaction with a particular institutional environment. Such research has already identified that the interaction between student predispositions - e.g. high school GPA, family background and career aspirations, etc - and college environmental attributes, - e.g. admission policies, institutional reputation, institutional reaching-out, student services and living environment, etc.- plays an important role in the student's decision to persist in achieving a degree or to drop out. Therefore, college experience should be a major consideration in studying Student Choice of Major.

Early studies on Student College Choice have identified three major categories of factors that influence it: (1) student predispositions, such as high school GPA, socioeconomic status (SES), parental income, educational aspiration and significant others (Alba & Levin, 1981; Anderson, 1981; Astin 1977; Bremanan & Nelson, 1981, Velez, 1985; cited in Stage & Hossler, 1989); (2) institutional attributes, such as, institution type, school and class size, programs of study, geographic locations and institutional efforts to communicate to prospective students (Chapman, D. 1981); and (3) other factors, such as distance from home (Loli & Sannell, 1983 in Welki & Navaratil, 1987), pricing policy (Chapman, R.G. 1979), financial aid, college printed materials, perceptions of university image and employment opportunities (Welki & Navaratil,

1987). Recent studies on College Choice have categorized four primary models of college choice (Hossler *et al.*, 1989): the econometrics model, the sociological model, the consumer model, and the combined model.

The econometrics model, derived from the human capital theory (Schultz, 1961; Becker, 1964 and Thurow, 1972), views College Choice as a result of an investment decision to seek higher future private rates of return by the individual and higher social rates of return by the public and the government. If the perceived future economic benefits of attending college overbalanced the present benefits of non-attenders, i.e., high school graduates, students would choose to go to college.

The sociological model focuses on the factors of socioeconomic status and personal predispositions such as, family background, parental education, educational aspirations and preparation for attaining higher socioeconomic status. Blau and Duncan's (1967) model of social status attainment has established the basic tenet for the sociological model. College Choice is thus viewed as a means to promote social mobility and advancement for desired socioeconomic status. In addition, in this model, college experience is given more weight as a major factor affecting socioeconomic status. As Smart (1988:41) concludes, "Abundant evidence suggests that the kind of college and universities students attended and their experiences in those institutions are inextricably linked to social mobility in American society."

The consumer model assumes that college choice is the result of the student's consideration of the cost and risk of alternatives of college attendance and non-attendance. The cost of attendance can be defined as the monetary costs of attending a college and opportunity costs for not working to earn money while in college. The risk means that the value of higher education may not be worth the costs for investment. When college attendance and degree attainment are perceived as a worthwhile action of risk-taking and effort-taking for a higher consumption and investment value, students would choose to go to college. Moreover, in this model, the expected non-monetary benefits such as satisfaction and self-fulfillment to be received from education are frequently compared to cost and risk by the consumer.

The combined model takes student college choice as a multi-staged process rather than a

single decision-making event (Stage & Hossler, 1989), which includes (1) predispositions, (2) search, and (3) choice. Particularly, the combined model introduces that student college choice is only based on partial information about alternatives (Hossler *et al.*, 1989). Because of the incomplete access to information about college options, perceived benefits and expectations are only relative to the present values of programs of study. In other words, Student College Choice largely depends upon students' perceptions associated with the available information about the present values of their choices. In a sense, the actual value of an academic degree by the time of graduation cannot be or is not predicted by students at the time of making a decision for a choice of majors. Thereafter, the perceived present value of the labor market variables and their actual future values may result in a time lag between present perceptions and future demands of the graduate labor market. This may explain the reason why the shift of student's choices of majors could be regarded as a mechanism to adjust the balance of supply and demand in the college graduate labor market.

Based upon the findings of previous studies on College Choice and the above discussions of the market models concerned, a model of Student Choice of Major can be established. This model has integrated some components in the above discussions. For example, student perceptions of economic benefits is drawn from the econometrics model; college experience and education aspirations with different socioeconomic status as motivator from the sociological model; satisfaction of self-fulfillment for personality development from the consumer model; the multiple-staged and dynamic process, and the availability of information in the process of decision making from the combined model. This Model of Student Choice of Major (Figure 1) can be described as follows: The student's initial Choice of Major is affected by his/her predispositions, school/college attributes, significant others and available financial aid and perceptions of economic factors (mainly labor market variables). Student Final Choice of Major differs from Student Initial Choice of Major in that the decision involves such factors as college experience (social and academic integrations), increased abilities of critical thinking and decision making, perceptions of quality of programs, self-fulfillment for personality development, perceptions of current labor market conditions, and availability and use of information for career development. College

experiences and perceptions of current labor market conditions influences the student's intent to attain the degree and final degree attainment.

(Insert Figure 1 here)

Student Choice of Major can be related to market theories about the changes of the supply and demand of the college graduate labor market, when the concept of "Human Capital" is introduced in discussion. Schultz (1961) and Becker (1964) used the term "the human capital" to emphasize pursuing higher education by the individual as an activity of both consumption and investment that may facilitate economic growth by fostering technological skills and increasing labor productivity.

Market theories postulate that the labor market facilitates the balance of supply and demand for manpower by flexible adjustments of the wages of a wide range of jobs over a period of time. An increase of the supply of graduates in certain occupations in the college graduate labor market would be expected to lead to a decrease in salary and demand for employees in these fields. This may lead to a turnover or shift of students' human capital investments to other fields of study in which they believe to have higher salary levels and more job opportunities. The price elasticity of supply and demand may affect student perceptions and Choice of Major, and thus the balance of supply and demand of the labor market. As Manski and Wise (1983:20) declare, "... the labor market condition is one of the five factors that determines student choice after high school." In a sense, the size of financial benefits, the likelihood of obtaining them and the time to obtain them in consideration of the discount rate are seriously considered by the student in choosing a college and a career.

Some studies suggest that the cohort size of college graduates has a great impact upon the shifts of job opportunities and employment and plays a critical role in linking Choice of Major with the demand of labor market. Berger (1988) pointed out that cohort size of college graduates was closely related to the depression in the earnings of the post World War II baby-boom cohorts relative to other workers. Berger argues, with the evidence of Freeman's research data (Freeman

1975, 1977 and 1980) and his own research findings (Berger 1983), that changes in size of entering cohorts have had an important impact on the change of the structure of earnings, and "...some of the most noticeable changes have been on the earnings of college graduates." To a large extent, entering cohort size may be the key factor affecting the balance of supply and demand in the economic cycles of the labor market.

Student Choice of Major and cohort size are largely influenced by the economic cycles of the college labor market, which may bring great changes in students' perceptions of the values of certain occupations. In explaining the changes of the cohort size and students' perceptions and investments, three models are outstanding: the Neoclassic Theory (Freeman 1970, 1976), the Job Screening Model (Spendcer, 1973) and the Job Competition Model (Thurow, 1969, 1975, cited in Baktari and Grassom, 1985).

The Neoclassic Theory predicts that reduced average wages and reduced rates of return of higher education will result from over-investment and over-education. This will change cohort size of labor force entrants and lead to a decline of average entry-level earnings and a discouragement of further investment.

The Job Screening model assumes that the labor market is characterized by imperfect information. As no other information is available to the employer, a higher education degree is often regarded as a favorable symbol of knowledge and skills that the employer seeks to identify more able and motivated individuals for optimal productivity. Hence, college graduates use higher education degrees to add amount to the symbol so as to distinguish themselves from others in a particular scope of the competitive labor market. If a market is overwhelmed with an overload of degree holders of the similar kind, the fear of unemployment will depreciate the values of the degree and thus prohibit further investment.

The Job Competition Model assumes that workers compete for available jobs by lining up in a queue. Due to an oversupply of college graduates in a field of occupation and long-time queuing, new college graduates may accept jobs with lower salaries, thus reducing the expected values of the degree and discouraging further investment.

Because of the changes of the college graduate labor market, there exist cyclical variations

in salaries for some occupations as shown in Figure 2.

(Insert Figure 2 here)

Some majors such as engineering, social sciences and physical sciences have larger shifts and some such as public services, education and liberal arts have smaller ones. Assumably, salary variations may affect students' perceptions of the values of particular field in career decisions. Some economists and researchers have already recognized the relationship between students' perceptions and the changes of economic factors. For example, Ritzen (1987:151) elaborates that "in Western industrialized countries decisions to participate in higher education are based on indicators of economic development. At the same time, these indicators are determined by the available supply of higher educated labor." To most students, these indicators of economic development may only mean job salaries and job opportunities. Thus students' perceptions of these indicators may have an important impact on student choices of majors and the entering cohort size of college graduates in certain fields of study. Freeman (1976:52) also points out: "If the supply behavior of the young is highly sensitive to such economic incentives as salaries and job opportunities, the number of new graduates will be an important homeostatic device, helping equilibrate the job market." These findings of the previous studies have established the interest and needs of this study to examine the economic aspects of Student Choice of Major to explain career choice, degree attainment and student retention.

The timing of the final choice and the reasons for change of majors are also important indicators to illustrate whether or not college experiences exert influence on Student Choice of Major. The similar patterns of Figure 3 and Figure 4 indicate that college upper-division enrollment in New York State is closely related to degrees conferred. Moreover, the patterns of Figures 3 and 4 closely match that of the nation-wide survey data Figure 5: The United States Bachelor's Degrees conferred. This implies that both regional and national data display the similar trends of the match of higher division enrollment and degree attainment. This means that most upper division students have made their choices of majors toward degree attainment. Therefore,

it is appropriate to select college juniors and seniors as subjects of this study.

(Insert Figure 3 here)

(Insert Figure 4 here)

(Insert Figure 5 here)

Socio-psychological development is another aspect in career development. As discussed above, the sociological model of college choice holds that educational aspirations and motivations depend upon socioeconomic status and predispositions. Supposedly, students' perceptions of labor market variables may be different in terms of socioeconomic status, gender, and ethnic background.

In addition, students in different majors may perceive labor market variables differently in their choice of majors. This indicates that people with similar interest and values about higher education may flock together. As Holland (1973) describes, career choices are determined by personality development among different groups of people in different environment. His career choice theory categorizes people in this society into six types: realistic, investigative, artistic, social, enterprising and conventional. These types of people are fostered in the similar types of environment. As he indicates, "Each type is the product of a characteristic interaction between a variety of cultural and personal forces, including peers, parents, social classes, culture, and the physical environment" (1973:53). Morrow (1971) and Nafgiger *et al* (1975) (cited in Hossler 1987) have also discovered that college majors had significant relations with personality type which led to greater student satisfaction and higher outcomes. In a greater sense, people of different groups may have different values and personalities in their career choices. For example, a national survey on 1985-86 bachelor's recipients' opinions about seeking work or additional education illustrates different opinions and preferences among graduates of different majors. Figure 6 illustrates that in the poor economic conditions of 1986, college graduates in different academic majors had different opinions about work or continuing their education. More than 35% of bachelors' degree recipients in engineering, business & management, health professions

and education sought work while more than 35% of graduates in social sciences, public affairs, physical sciences and humanities sought additional education, especially those in humanities (47%).

(Insert Figure 6 here)

This implies that students in different majors may have different perceptions of or give different weights to labor market variables in their career choices.

Some studies have provided findings illustrating that psychic and economic costs required for the preparation of an occupation, and the availability of jobs in the labor market are important factors considered by individuals who make a decision for a field of study. For instance, Wheeler's (1983) study offers some evidence that the perceptions of the labor market variables are similar among students in education, psychology and business. He points out that "These variables are associated with a particular occupation at a given point in time." However, Osgood (1987) studied students' perceptions of salary/cost ratio among business, education and psychology majors and claimed that "Salary/Cost ratio has a higher correlation coefficient for business majors than the total reward/cost ratio with occupational choice as the dependent variable. This would indicate that business majors perceive salary in relation to costs as more important than education and psychology majors for this sample." Freeman's (1971) study evidenced that different groups of students have different perceptions of occupations in the labor market. Ginzberg (1975) also concludes that difference in choices of majors and preparations of occupations are primarily the result of different perceptions of the labor market. Bosworth and Ford's (1985) study on college entrants' perceptions of the labor market reveals that college entrants recognize the importance of the level and range of the labor market variables when making career decisions. The mixed findings of these studies stimulate the interest of the present study in further examining students' perceptions of the labor market in different majors.

Design of the Research

There are three main issues to be examined: (1) the significance of perceptions of labor market variables compared to other variables in Student Choice of Major, (2) the use and acquisition of information for Choice of Major, and (3) the timing of choice decisions. Six hypotheses have been tested for these issues by quantitative analysis as follows:

1. Students' perceptions of labor market variables such as job opportunities, salaries and job advancement have a significant impact on student choices of majors, as these are important economic indicators that students consider in their human capital investments.

2. Students in different majors perceive the importance of labor market variables differently. Students with similar interest, education aspirations and personality oreientation may group together. The strength of such relationships varies from major to major.

3. Students of different socioeconomic background, gender and race have different perceptions of labor market variables in their Choice of Majors. Different socioeconomic status may foster different motivations, expectations and educational aspirations. Students of lower Social Economic Status (SES) may be more labor-market-oriented than those of higher SES due to their financial constraints and lower educational aspirations, as education aspirations are generally associated with SES.

4. The student's intent to achieve the degree/to continue for graduate studies is generally related to perceptions of current labor market conditions, but differ from major to major.

5. Use of information for Choice of Major indicates that the student's campus experience offer relevant information for students' decisions on majors.

6. Most students make their final decisions of majors while being enrolled in college.

A sample survey was conducted with the students selected from a comprehensive research university in the middle state of New York. The subjects of the survey were juniors and seniors categorized into eight fields of study: engineering, business and management, health professions, public affairs and services, physical sciences, social sciences, computer sciences and humanities.

according to the standard categories set by The Statistic Abstract of the U.S, which cover the general range of distinguished and important fields of study and have typical representativeness of higher education programs.

The sample was selected through the method of stratified sampling according to the ratios of the students in each major area against the total student population of the selected institution. Within the stratified sampling, random sampling of subjects in each major area was drawn by a computer program in the Registrar's Office of the institution. 1,370 survey questionnaires of 63 items were sent out with a cover letter and a self-addressed and self-stamped envelop to the sampled subjects two to three weeks after the beginning of the semester of Spring 1994. A total of 573 students returned the questionnaires. 570 questionnaires were considered usable, which brings the response rate to 42% with one mailing.

The dependent variable for the study is Student Choice of Major, that is, eight selected majors. The main independent variables are student perceptions of labor market variables such as salary, job opportunities and job advancement and other variables. The following is the list of the variable groups of the questionnaire:

Demographics:

- Gender
- Age
- Race
- Student status: full-time/part-time
- Work hours
- Financial aid status
- College GPA
- Family background and income (SES)

Perceptions of Labor Market Variables:

- Employment opportunity and job availability
- Financial rewards available (entry-level salary, life-time salary, and fringe benefits)
- Job advancement opportunity
- Offering more transferable skills for employment
- Academic program useful for employment

Perceived Quality of Programs:

- Reputation of the program
- Interesting/stimulating courses
- Qualified faculty and instruction
- Demanding courses
- Learning more useful and practical skills
- Feeling comfortable with the course/program

Personality Orientation (Self-Fulfillment):
- Investigate-type (research oriented)
- People-type (community services)
- Intellectually-oriented with logical thinking
- Politically-oriented (leader type)
- Business-type (out-going and managing)
- Creative-type (artistic)
- Personality fit

Role of Significant Others and Information Sources:
- Selected the program on the student's own
- Good advisement of the program
- Parents' suggestions
- Friends in the program offering information
- High school teacher's suggestions
- High school counselor's advice
- College counselor's advice
- Faculty members' recommendation
- Career Center's advice
- Information from viewbooks/recruiting materials
- Information from extracurricular activities
- Other

Intent to Achieve the Degree/Continue for Graduate Studies:
- Likely to obtain the degree within four years
- Likely to find a job after graduation
- Likely to go to graduate studies after graduation

Perceptions of the Current Labor Market:
- Current labor market is good for the selected major
- If not, likely to stay in school rather than being unemployed
- Get the degree and find a job as soon as possible
- No problem to find a job in the field of study after receiving the degree
- No problem to find a job in other fields after receiving the degree
- Would go on to graduate studies because economy is poor

- Don't care about the labor market

Approaches to Career Choice:

- Watching labor market conditions
- Taking tests to find out the right choice
- Pursuing the values of a job
- Reading job advertisements
- Seeking career guidance/counseling
- Asking friends' or parents' opinions
- Asking professionals or faculty members' opinions

Values for A Job:

- Fulfilling personal goals and values
- Fitting personal abilities
- Fitting personal interest
- Meeting desires for higher salary and benefits
- Meeting desires for higher social standing

Factors for College Choice:

- Type of the institution: public/prive
- Size of the instituion
- Size of the program
- Good reputation of the institution
- Good/favorate extracurricular activities
- Identify with fellow students
- Geographic locations
- Near home
- Good residential life on campus
- Lower cost of tuitions
- Lower cost of living expenses in the area
- Good financial aid available
- Good student orientation and counseling
- Good career development services
- Other

The Timing of the Final Choice Decision:

- High school junior year
- High school senior year
- Freshman year
- Sophomore year
- Junior year
- Senior year

Reasons for Change of Major:

- Whether ever changed major or not?
- Times of change of major
- Too hard to study for the former major/majors
- Labor market was not good for the former major
- Listened to other's advice for a better choice
- Financial problems to give up the former major/s
- Family or personal problems to give up the former major/s
- Poor quality of the program
- The former program was impractical.
- Difficult to find a job for the former program
- Other

Data Analysis

Among 570 usable questionnaires 41.7% respondents are male and 58.3% are female with one missing value. 91.6% percent subjects are full-time students and only 8.4% are part-time students. This generally satisfies the author's intention and plan for studying Choice of Major among traditional college students. Juniors and seniors were about equally represented in the sample, 49.5 % and 50.5% respectively. Students in all selected major areas responded to the survey. Table 1 displays a comparison of the sample distribution and the distribution of the University's actual population in eight major areas. Engineering and Health Professions are twice over-represented compared to the target population. All other majors in the sample are relatively close to the population. The survey sample can be said to adequately represent the target population.

Table 1. Comparison of the Distributions of Major Areas in Sample and Population

Major Area	Sample %	Population %
Engineering	9.8	4.7
Business	12.6	13.8
Health Professions	10.0	4.2
Physical Sciences	14.6	16.7
Social Sciences	22.5	24.7
Public Services	6.8	7.8

Humanities	17.5	24.4
Computer Sciences	6.2	3.4
Total	100	*99.7

* Education (.3%) is dropped from the sample.

The representativeness of ethnic groups of the returned questionnaires is also close to the actual distribution of the target population except for Hispanic and African American groups which are under-represented in the sample (Table 2).

Table 2. Comparison of Ethnic Groups of Sample and Population

Ethnic Group	Sample %	Population %
Hispanic	3.5	5
White - Non Hispanic	77.7	77
African American	3.9	5
Asian/Pacific Islander	11.7	10
Native American	0.7	1
Other	2.5	2
Total	100	100

40.7% of the students were receiving financial aid from the school for the academic year and 58.8% were not. Of those who were receiving financial aid, 48.7% had $2,000 or more for the academic year. In the sample, 62% of the students reported college GPA between 2.51 to 3.50, with 33.5% reporting a GPA above 3.51. As for family financial status, 93.2% students reported their family annual incomes. Most of the respondents were from middle-income families (Mean and Median are in the range of $30,001 to $50,000, and Mode is in $50,001 to $70,000). 97.4% of the respondents have reported father's education level. The largest four groups are those whose fathers have a high school diploma, some college, a master/professional degree or a bachelor's degree. The reported mother's education has the similar distribution to father's

education. The reported father's and mother's education levels are compatible with reported annual family incomes, which reveals that most of the respondents are from middle-income families.

Factor analysis and discriminant analysis were used to test Hypothesis 1. Because there are 48 Likert-type variables related to Student Choice of Major, principle component analysis in factor analysis was used to reduce the number of variables. The principal component analysis generated eleven factors that are closely match the variables designed in the survey questionnaire. For a valid principal component analysis, a rule of thumb is that the sample size must be large enough for the individual variables and the overall analysis by the test of "sample adequacy". The KMO Measure of Sampling Adequacy (MSA) Test shows that the overall MSA of the 48 variables is 0.82039, which is meritorious according to the rule of Index (Kaiser 1974, cited in Kim & Mueller, 1978, p54). The Barlet Sphericity Test brings forward the large significance to reject the null hypothesis: $R=I$, that is, the correlation matrix is equal to the identical matrix:

Kaiser-Meyer-Olkin Measure of Sampling Adequacy = .82264
Bartlett Test of Sphericity = 7636.0455, Significance = .00000

The elevent factors generated by the principal components analysis, accounting for 62.8% of the total variance. Table 3 displays the result of 11 factors extracted by the varimax rotation.

Table 3. Factors of Principal Component Analysis

Final Statistics:

Variable	Communality	*	Factor	Eigenvalue	Pct of Var	Cum Pct
		*				
Q10_1	.78378	*	1	6.57654	17.3	17.3
Q11_1	.78824	*	2	3.43092	9.0	26.3
Q12_1	.75385	*	3	3.24076	8.5	34.9
Q13_1	.70568	*	4	1.90012	5.0	39.9
Q14_1	.58666	*	5	1.67818	4.4	44.3
Q15_1	.60235	*	6	1.35539	3.6	47.8
Q16_1	.58522	*	7	1.30872	3.4	51.3
Q17_1	.56011	*	8	1.22115	3.2	54.5
Q18_1	.64835	*	9	1.08391	2.9	57.4
Q19_1	.70734	*	10	1.05785	2.8	60.1
Q20_1	.63195	*	11	1.02226	2.7	62.8
Q21_1	.71195	*				
Q22_1	.54343	*				
Q23_1	.65156	*				

Q24_1	.63133 *
Q25_1	.73230 *
Q26_1	.57331 *
Q27_1	.62666 *
Q28_1	.57981 *
Q29_1	.45933 *
Q30_1	.69512 *
Q31_1	.56734 *
Q32_1	.71732 *
Q33_1	.72197 *
Q34_1	.70816 *
Q35_1	.69342 *
Q36_1	.54029 *
Q37_1	.46218 *
Q38_1	.50402 *
Q39_1	.62867 *
Q40_1	.44906 *
Q41_1	.61093 *
Q42_1	.63700 *
Q43_1	.71654 *
Q44_1	.58744 *
Q45_1	.58804 *
Q46_1	.73894 *
Q47_1	.44615 *

Table 3 displays that the factor loadings are very high. As all 11 factors are logically fit in the conceptual framework of this study, factors with loadings above 0.6 were retained for further discriminant analysis.

These eleven factor-constructs can be named as:

1. Job Salary & Benefits
2. Job Opportunity
3. College Influences
4. Practical Utility of Program/courses
5. Intellectual-orientation Personality
6. People-orientation Personality
7. Continuing Education/Finding A Job Construct
8. Personality Fit
9. High School Influence
10. Family/Friends' Influence
11. Intent to Achieve the Degree.

These factors have a close match to the variable groups designed in the questionnaire. This indicates that the conceptual framework is largely true to the real data. Factor 1, the salary and benefits, is the first important factor in varimax rotation, which accounts for 17.3% of the total

variance. The job opportunity is the second, which accounts for 9% of the total variance. The first five factors that account for 44.3% of variance for Student Choice of Major are job salary and benefits, job opportunities, college influence, program practical utility and personality orientation. This data analysis supports Hypothesis 1 that labor market variables are important factors in Student Choice of Majors.

Discriminant analysis was then employed to test the weights of importance of perceptions of the labor market variables and other variables among different choices of majors. The results show that perceptions of labor market variables combined with the self-perceived personality orientation are the most significant factors in students' considerations of academic choices among different academic majors. The Univariate Analysis shows that 10 out of 11 extracted factors are significant. Factor 1 and Factor 2 (labor market variables) have the largest variance in the Univariate Analysis, which account for 27.2% and 28.6% of the total variance respectively (Table 4).

Table 4. Univariate Analysis in Discriminant Analysis

Wilks' Lambda (U-statistic) and Univariate F-ratio with 7 and 474 degrees of freedom			
Variable	Wilks' Lambda	F	Significance
F1	.71329	27.22	***.0000
F2	.70320	28.58	***.0000
F3	.99086	.62	.7356
F4	.77463	19.70	***.0000
F5	.89221	8.18	***.0000
F6	.80540	16.36	***.0000
F7	.94928	3.63	***.0008
F8	.93797	4.48	***.0001
F9	.97053	2.06	*.0469
F10	.93900	4.40	***.0001
F11	.95011	3.56	***.0010
CHANGE1	.99386	.42	.8911
CHANGE2	.97891	1.46	.1799

FED1	98499	1.03	.4076
FED2	96734	2.29	*.0268
MED1	99395	.41	.8947
MED2	98174	1.26	.2687
JUNIOR	96674	2.33	*.0241
Q58	98730	.87	.5291
Q60	97553	1.70	.1071
Q61	97400	1.81	.0838
SEX	83101	13.77	***.0000
WHITE	97552	1.70	.1069
YEAR1	93421	4.77	***.0000
YEAR2	96738	2.28	*.0270
YEAR3	92959	5.13	***.0000

*** p<.001

** p<.01

The total variance for labor market variables are 55.8%, thus indicating perceptions of labor market variables are most important factors in Choice of Major. The discriminant analysis turns out four significant descriptive functions, as shown in Table 5.

Table 5. Functions in Discriminant Analysis

Canonical Discriminant Functions

Fcn	Eigenvalue	Pct of Variance	Cum Pct	Canonical Corr	After Fcn	Wilks' Lambda	Chi-square	df	Sig
				:	0	.208989	730.293	147	.0000**
1*	.9205	46.00	46.00	.6923 :	1	.401368	425.857	120	.0000**
2*	.6300	31.48	77.48	.6217 :	2	.654228	197.936	95	.0000**
3*	.1825	9.12	86.60	.3929 :	3	.773644	119.724	72	.0004**
4*	.1266	6.33	92.93	.3352 :	4	.871576	64.122	51	.1026
5*	.0821	4.10	97.03	.2755 :	5	.943138	27.310	32	.7030
6*	.0347	1.73	98.76	.1831 :	6	.975843	11.408	15	.7232
7*	.0248	1.24	100.00	.1554 :					

* Marks the 7 canonical discriminant functions remaining in the analysis.

** p<.001

These four functions account for 93% of the total variance. Function 1 and function 2 account for the largest extracted variance (46% and 31% respectively).

Table 6 illustrates function coefficients for the model of Student Choice of Major among different academic majors. Table 7 illustrates correlations between factors and each functions of the model. Both tables were used to interpret function loadings of the analysis.

Table 6. Discriminant Analysis of Difference of Choice of Majors

Standardized canonical discriminant function coefficients				
	Function 1	Function 2	Function 3	Function 4
Salary & Benefits (F1)	-0.45871	0.23303	-0.04842	-0.55162
Job Opportunities (F2)	-0.10679	0.50018	0.26709	0.65273
Practical Utility (F4)	-0.35760	0.00596	-0.37341	-0.00060
Intellectual-Orientation (F5)	-0.16883	-0.62986	0.20566	0.33415
People-Orientation (F6)	0.60197	0.40733	-0.13125	-0.37598
Continuing Education (F7)	0.11365	0.06090	0.17861	0.14296
Personality Fit (F8)	0.07752	0.00844	0.44224	0.11796
High School Influence (F9)	0.02175	-0.17219	0.05016	-0.01300
Family/Friends' Influence (F10)	-0.12916	-0.09279	0.05164	0.26405
Intent to Achieve Degree (F11)	0.15952	-0.01702	-0.30698	0.21433
Change Major More Than Once	0.12633	0.02696	0.00319	-0.03102
Father's Ed. (Graduate Studies)	-0.09752	0.02012	-0.13734	-0.01999
Junior Student	0.12608	0.10652	-0.10473	-0.09780
Mother's Ed. (Graduate Studies)	0.01456	0.12567	0.02790	0.16364
College GPA	0.11088	0.06081	-0.28329	-0.07266
Family Annual Income	0.11238	-0.01055	-0.05792	0.33816
Female	0.21377	0.33245	0.04389	0.11892
White	-0.02119	-0.0333	-0.00433	-0.46112
Lower College Division	0.28709	-0.08916	0.20624	0.15215
Upper College Division	0.12983	-0.00973	-0.29886	0.15989
Other than Lower/Upper/HS	0.04838	0.05152	0.5803	-0.00787

Table 7. Discriminant Analysis: Correlations

Structure matrix:

Pooled within-groups correlations between discriminating variables and canonical discriminant functions
(Variables ordered by size of correlation within function)

	Func 1	Func 2	Func 3	Func 4
Salary & Benefits	.59439*	.32726	.04411	.20503
Practical Utility	.48117*	.32196	.13161	.06059
People_Type	.44341*	.28278	.04579	.20844
Job Opportunity	.37983	.64730*	.16089	.38286
Male	.31620	.41084*	.02577	.10612
Intellectual-Type	.02202	.40960*	.23238	.12516
Other Than Lower/Upper Div	.08780	.12961	.53838*	.12311
Personality Fit	.15242	.03554	.48571*	.05341
Upper Division Decision	.07016	-.00330	-.38615*	.08414
College GPA	.14637	-.01513	-.15652*	.05307
White	-.00366	.04232	.02939	-.36285*
Family Annual Income	.02858	-.01914	-.22843	.33743*
Intent to achieve Degree	.16107	.01143	-.29020	.29854*
Family/Friends' Influence	-.18985	-.07513	-.10094	.27463
Junior Student	.03597	.19005	.00484	-.07527
Mother's Ed (Graduate Study)	.02286	.01919	-.11438	.19526
Lower-division Decision	.22648	-.16790	.06993	.09694
Father's Ed (Graduate Study	.01415	-.01900	-.20024	.17614
Continuing Education	.06634	.20446	.24918	.13558
High School Influence	-.10323	-.16399	.01230	.05581
Change Major More Than Once	.12881	-.04579	-.05764	-.00760

* denotes largest absolute correlation between each variable and any discriminant function

The results show that labor market perceptions combined with different personality orientation enable students to flock together into four major types of Choice of Majors. Function 1 is characterized by the People-orientation Personality vs. Salary Continuum, that is, groups that scored higher on people-orientation personality scored lower on salary & benefits in their Choice of Majors or visa versa. Function 2 is the Job Opportunity vs. Intellectual-orientation Personality Continuum. It also means that groups that scored higher on Job Opportunity scored lower on Intellectual-orientation Personality or visa versa. These two functions are the major

ones that distinguish Student Choice of Majors in different areas, as they account for 77.5% of the total variance (Table 6). Function 3 presents an upper division decision and personality fit construct. This function appears to form a personality fit and upper college level decision continuum, that is, groups that scored higher on the personality fit also scored higher on the upper-level decision making. It implies that students who pursue personality fit might make their decisions on choices of majors or change their majors at the upper level of college years as late decision makers. Function 4 has two highest correlations of coefficients of Job Opportunity and White. As White has a negative sign, it may mean that non-white respondents are likely to score higher on job opportunities. But this function is very weak, accounting only for 6.3% of the total variance.

Since the first two functions are the major factors (77% of variance) to explain student choice of different majors, plotting the first two discriminant functions into a graphic territory map has generated four types of students among the eight selected majors (Figure 7): (1) the high job opportunity and high people-oriented personality type, (2) the high job opportunity and high salary type, (3) the high salary and high intellectual-orientated personality type , and (4) the high people-oriented personality and high intellectual-oriented personality type. If a vertical line and a horizontal line are drawn across the map with the two functions labeled on the continuum, four distinguishable areas appear on the plain, where most majors have their own territories.

(Insert Figure 7 here)

Obviously, the majority of health professions lands in Area I: the High People-oriented and High Job Opportunity Type. Business and Computer Science and part of Health Professions reside in Area II: the High Salary & High Job Opportunity Type. Engineering and the majority of Physical Sciences fall in Area III: the High Salary & High Intellectual-orientation Type. Social Sciences, Humanities and part of Physical Sciences belong to Area IV: the High People-orientated Personality & High Intellectual-oriented Personality Type. Public Services has no territory as it shares common characteristics with social sciences and humanities. The validity of

the model of the discriminant functions were also tested by the classification of group memberships of the raw data. Theoretically, the average prior probability for predicting each group membership is 1/8=12.5%. Since the largest group in this analysis is Social Sciences which makes up 22% of this sample, the discriminant functions will be valid if 22% percent of students are correctly classified into this group. Table 8 shows that 58.7% of students are correctly classified into this group which is much higher than 22% actual classification. Suffice it to say, the discriminant functions are valid in interpreting student choice of different majors.

Table 8 Group Membership Classification

Actual Group	No. of Cases	Predicted Group Membership 1	2	3	4
Group 1 ENGINEERING	47	34 72.3%	2 4.3%	0 0.0%	3 6.4%
Group 2 BUSINESS	59	4 6.8%	36 61.0%	4 6.8%	3 5.1%
Group 3 HEALTH PROF	52	0 0.0%	11 21.2%	38 73.1%	0 0.0%
Group 4 PHYSICAL SCI	68	8 11.8%	4 5.9%	3 4.4%	27 39.7%
Group 5 SOCIAL SCI	109	3 2.8%	3 2.8%	5 4.6%	10 9.2%
Group 6 PUBLIC SERVICES	34	2 5.9%	2 5.9%	3 8.8%	2 5.9%
Group 7 HUMANITIES	83	2 2.4%	4 4.8%	6 7.2%	10 12.0%
Group 8 COMPUTER	30	7 23.3%	4 13.3%	1 3.3%	6 20.0%

Actual Group	No. of Cases	Predicted Group Membership 5	6	7	8
Group 1 ENGINEERING	47	4 8.5%	0 0.0%	0 0.0%	4 8.5%
Group 2 BUSINESS	59	9 15.3%	0 0.0%	1 1.7%	2 3.4%
Group 3 HEALTH PROF	52	2 3.8%	1 1.9%	0 0.0%	0 0.0%
Group 4 PHYSICAL SCI	68	17 25.0%	0 0.0%	7 10.3%	2 2.9%
Group 5 SOCIAL SCI	109	64 58.7%	2 1.8%	19 17.4%	3 2.8%
Group 6 PUBLIC SERVICES	34	17 50.0%	2 5.9%	6 17.6%	0 0.0%
Group 7 HUMANITIES	83	31 37.3%	1 1.2%	29 34.9%	0 0.0%
Group 8 COMPUTER	30	0 0.0%	0 0.0%	0 0.0%	12 40.0%

Percent of "grouped" cases correctly classified: 50.21%

Classification processing summary

570 (Unweighted) cases were processed.
0 cases were excluded for missing or out-of-range group codes.
88 cases had at least one missing discriminating variable.
482 (Unweighted) cases were used for printed output.

This table also shows that Engineering, Business and Health Professions have a very high percentage of correct classification (73.2%, 61.0% and 73.1% respectively). This means that the two discriminant functions work very well for these three groups of students. Public Services has the lowest percentage of correct classification (5.9%). Most students from this group were classified into Social Sciences (50%). This is not surprising as the two majors generally share the basic subject matter of knowledge and students may share the same courses with similar interest in their studies.

In summary, the discriminant analysis produced two major functions in choice of different majors, i.e. the labor market variables and personality orientation, which account for 77.5% of the total variance. It reveals that students' perceptions of labor market variables combined with perceived personality orientation can explain most of student choice of different majors. This study has also displayed that in their choices of majors, students can be generally categorized into these four major types, with regard to their labor market perceptions and perceived personality orientation, when gender, race, SES, timing of choice decision, change of major and student status are controlled. Choice of Major is strongly affected by the match of subcultural traits of the chosen major and student perceptions of labor market variables and personality orientation. Obviously, students in health professions perceive higher values of job opportunities and tend to be more people-oriented. These features match the requirements of the profession. Students in business, computer sciences and some in health professions have higher values for job opportunities and salary & benefits. Students in engineering and physical sciences cherish not only higher values of salary and benefits but also are largely intellectually oriented. Such occupations may provide students with higher social status, and generally require the right people in the right position. In fact, higher intellectual work often redeems a higher compensation as a reward for the students with the ability to pursue the profession. Students in social sciences and humanities are characterized by strong personality orientations: both people and intellectual oriented. Personality fit seems more important than monetary rewards for these students. The analysis of this data confirms Hypothesis 1 and Hypothesis 2 that students' perceptions of labor market variables have a great impact on their choices of majors and different

majors have different perceptions of labor market variables and different perceived personality orientations in Choice of Majors.

In addition, it provides substantial evidence to support Holland's vocational choice theory, that is, people with similar personality traits and perceptions may flock together in their career choices. The results also support the human capital theory that higher education is regarded as both consumption (for personality fit) and investment (for monetary and non-monetary rewards) for career development. Students in different majors may look for different rewards in the activities of their consumption and investment, although such consumption and investment may not be directly related to the expectations for higher rates of return of lifetime incomes.

MANOVA was used to test Hypothesis 3: the differences between gender, SES, Race on Choice of Majors. Factor 1 (Salary and Benefits) and factor 2 (Job Opportunities) generated by the first factor analysis were used as the dependent variables. Variables such as gender, father's education, mother's education, family annual income were used as independent variables. Table 7 shows the result of MANOVA on salary and job opportunity by race.

Table 7. MANOVA on Salary and Job Opportunity by Ethnic Groups

Variable	Hyp. SS	Err. SS	Hyp. MS	Err. MS	F	Sig. of F
SALARY	.68906	489.98640	.13781	.92276	.14935	.980
JOB_OPPT	10.93136	594.69537	2.18627	1.11995	1.95211	.084

TEST	Value	Approx. F	Hyp. DF	Err. DF	Sig. of F
Pillais	.02459	1.32173	10.00	1062.00	.214
Hotellings	.2514	1.33009	10.00	1058.00	.209
Wilks	.97544	1.32593	10.00	1060.00	.211
Box =		19.1190			
F with (15,1633) DF =		1.16290		p= .294	
Chi-Square with 15 DF =		17.61902		p= .283	

It indicates that race has made no significant differences on perceptions of salary and job

opportunity.

MANOVA on salary and job opportunity by father's education and mother's education shows that neither father's nor mother's education has any statistically significant effect on students' perceptions of labor market variables. (Tables 10 and 11)

Table 10. MANOVA on Salary and Job Opportunity by Father's Education

Variable	Hyp. SS	Err. SS	Hyp. MS	Err. MS	F	Sig. of F
SALARY	1.34059	486.56585	.67030	.92153	.72738	.484
JOB_OPPT	.26807	592.92884	.13403	1.12297	.11936	.888

TEST	Value	Approx. F	Hyp. DF	Err. DF	Sig. of F
Pillais	.00306	.40493	4.00	1056.00	.805
Hotellings	.00307	.40390	4.00	1052.00	.806
Wilks	.99694	.40442	4.00	1054.00	.806
Box =			11.13177		
F with (15,1633) DF =			1.84497	p=	.086
Chi-Square with 15 DF =			11.06981	p=	.086

Table 11. MANOVA of Salary and Job Opportunity by Mother's Education

Variable	Hyp. SS	Err. SS	Hyp. MS	Err. MS	F	Sig. of F
SALARY	.47815	491.08199	.23908	.92482	.25851	.772
JOB_OPPT	.49605	606.83894	.24803	1.14282	.21703	.805

TEST	Value	Approx. F	Hyp. DF	Err. DF	Sig. of F
Pillais	.00229	.30433	4.00	1062.00	.875
Hotellings	.00229	.30324	4.00	1058.00	.876
Wilks	.99771	.30378	4.00	1060.00	.876
Boxs M =			9.02372		
F with (6,1943136) DF =			1.49504	p=	.175
Chi-Square with 15 DF =			8.97028	p=	.175

MANOVA on salary and job opportunity by family annual income shows that family annual income has no significant effect on students' perceptions of labor market variables (Table 12).

Table 12. MANOVA on Salary and Job Opportunity by Family Annual Incomes

Variable	Hyp. SS	Err. SS	Hyp. MS	Err. MS	F	Sig. of F
SALARY	2.93884	460.24932	.73471	.91138	.80615	.552
JOB_OPPT	8.69823	562.96190	2.17456	1.1478	1.95067	.101

TEST	Value	Approx. F	Hyp. DF	Err. DF	Sig. of F
Pillais	.01701	1.08318	8.00	1010.00	.372
Hotellings	.01725	1.08477	8.00	1006.00	.371
Wilks	.98301	.08398	8.00	1008.00	.372
Boxs M =		20.07499			
F with (6,1943136) DF =		1.65142		p= .071	
Chi-Square with 15 DF =		19.81792		p= .071	

Suffice it to say that students' socioeconomic status has no significant effect on student perceptions of labor market variables.

However, MANOVA on salary and job opportunity by gender (Table 13) has revealed that gender has a significant effect on student perceptions of labor market variables.

Table 13. MANOVA on Salary and Job Opportunity by Gender

Variable	Hyp. SS	Err. SS	Hyp. MS	Err. MS	F	Sig. of F
SALARY	10.22137	488.28839	10.22137	.90257	11.32479	** .001
JOB_OPPT	5.46924	612.05726	5.46924	1.13134	4.8384	* .028

TEST	Value	Approx. F	Hyp. DF	Err. DF	Sig. of F
Pillais	.06345	18.29235	2.00	540.00	.000
Hotellings	.06775	18.29235	2.00	540.00	.000
Wilks	.93655	18.29235	2.00	540.00	.000

** p<.01
* p<.05

Female students appear to value more job opportunities than male students who appear to cherish more values on salary and benefits than female students.

In order to check the difference between male and female students, a discriminant analysis of labor market variables by gender was conducted. Table 14 of the discriminant analysis shows that the two variables have high function loadings with opposite signs. This implies that the group scored higher in SALARY scored lower in JOB_OPPT and vise versa. So, male students scored higher on salary and female students scored higher on job opportunity. Undoubtedly, male and female students have different perceptions of the labor market variables.

Table 14. Discriminant Analysis on Labor Market Variables by Gender

Canonical Discriminant Functions

Fcn	Eigenvalue	Pct of Variance	Cum Pct	Canonical Corr	After Fcn	Wilks' Lambda	Chi-square	df	Sig
					0	.936549	35.399	2	.0000
1*	.0677	100.00	100.00	.2519					

* Marks the 1 canonical discriminant functions remaining in the analysis.

Standardized canonical discriminant function coefficients

	Func 1
SALARY	1.13652
JOB_OPPT	-1.01400

Structure matrix:

Pooled within-groups correlations between discriminating variables and canonical discriminant functions

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(Variables ordered by size of correlation within function)

	Func 1
SALARY	.55586
JOB_OPPT	-.36317

Canonical discriminant functions evaluated at group means (group centroids)

Group	Func 1
1	.30887
2	-.21854

This data analysis does not fully support Hypothesis 3 that students of different SES may have different perceptions of labor market variables and conditions in their choice of majors. Only gender has a statistically significant effect on such perceptions. It implies that Choice of Major is more a subjective matter than an objective matter.

The intent to persist or drop out is a very good indicator in student persistence and attrition studies (Cabrera et al. , 1991). Similarly, the variable of the intent to achieve the degree is adopted as a measure to test students' decisions on Choice of Major and degree attainment. Because the subjects of this study, as designed, were upper division college students and were assumed to persist in their final choices of majors, the intent to achieve the degree can be used to measure the effects that some variables may have on students retention and final Choice of Majors.

Multiple regression models were used to test Hypothesis 4: the effects of selected variables on the student's intent to achieve the degree. A factor analysis was then conducted with twenty questions directly asking the students about the factors that affect their Choice of Majors and College Choice. Seven factors were extracted from these 20 variables. Table 15 displays seven factors which account for 65.9% of the total variance.

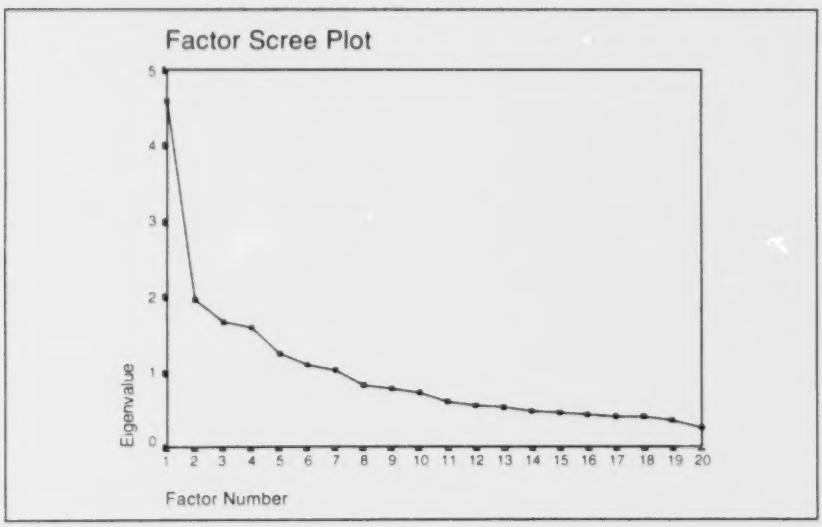
Table 15. Factor Analysis For Choice Factors (Q52_1 to Q53_14)

Final Statistics:

Variable	Communality	*	Factor	Eigenvalue	Pct of Var	Cum Pct
		*				
Q52_1	.66838	*	1	4.58376	22.9	22.9
Q52_2	.68006	*	2	1.96018	9.8	32.7
Q52_3	.56071	*	3	1.66069	8.3	41.0
Q52_4	.73421	*	4	1.60229	8.0	49.0
Q52_5	.78358	*	5	1.26007	6.3	55.3
Q52_6	.62436	*	6	1.09110	5.5	60.8
Q53_1	.51048	*	7	1.01637	5.1	65.9
Q53_2	.76162	*				
Q53_3	.65095	*				
Q53_4	.39939	*				
Q53_5	.63899	*				
Q53_6	.67921	*				
Q53_7	.61850	*				
Q53_8	.72895	*				
Q53_9	.63670	*				
Q53_10	.75653	*				
Q53_11	.67139	*				
Q53_12	.60307	*				
Q53_13	.75364	*				
Q53_14	.71372	*				

The Scree Plot (Figure 8) shows that these seven factors are the true factors

Figure. 8. Scree Plot for factors Q52_1 to Q53_14



These seven

factors can be named as:

1. School Outreach Services
   - Q53_13 "Good student orientation/counseling"
   - Q53_14 "Good career development services"
   - Q53_12 "Good financial aid available"

2. Academic Integration
   - Q52_1 "The interesting/stimulating courses of the program"
   - Q52_2 "Higher qualifications of faculty and instruction of the program"
   - Q52_3 "Higher demanding of the courses in the program"
   - Q52_6 "My feelings of comfortableness with the course of the program"

3. Social Integration
   - Q53_6 "Identity with fellow students"
   - Q53_5 "Good/favorite extracurricular activities"
   - Q53_9 "Good residential life on campus"

4. School Attributes
   - Q53_2 "Size of the institution: Large/small/medium"
   - Q53_1 "Type of Institutions: public/private"
   - Q53_3 "Size of the program"

5. Practical Utility
   - Q52_5 "The large possibility of finding a job once I have graduated"
   - Q52_4 "More useful and practical skills the course of the program provide"

6. Lower Cost
   - Q53_10 "Low cost of tuition"
   - Q53_11 "Low cost of living expenses in the area"

7. Location
   - Q53_8 "Near home"
   - Q53_7 "Geographical locations: large city/suburban area"

Factor 1 alone accounts for 22.9% of the total variance. After these choice factors were merged with demographic variables such as majors, father's education, mother's education and timing of choice decision, a third factor analysis was conducted and generated four factors which account for 55.5% of the total variance (Table 16).

Table 16. Extracted Factors for Regression Analysis

Final Statistics: Variable	Communality	*	Factor	Eigenvalue	Pct of Var	Cum Pct
F1	.60711	*	1	2.92872	19.5	19.5
F2	.67203	*	2	2.38454	15.9	35.4
F3	.64053	*	3	1.84679	12.3	47.7
F4	.67643	*	4	1.16530	7.8	55.5
F5	.50898	*				
F6	.41974	*				
F7	.31109	*				
F8	.57339	*				
F9	.60542	*				
F10	.53952	*				
F2_1	.54439	*				
F2_2	.51910	*				
F2_3	.57568	*				
F2_4	.45831	*				
F2_5	.67363	*				

These four factor constructs are:

1. Perceptions of Labor Market Variables
   - F4 - Practical Utility of the Major
   - F2 - Job Opportunities
   - F2_5 Practical Utility of the Program/courses

2. Social Integration & School Services (Student-Institution Fit)
   - F2_3 - Social Integration
   - F2-1 - School Services
   - F2-4 - School Attributes

3. Personality Development
   - F8 - Personality Fit
   - F5 - Intellectual- Orientation

4. Significant Other's Influence
   - F9 - High School Advisement
   - F3 - College Advisement
   - F10 - Family/Friends' Influence

The next step was to include demographic variables for a multiple regression modeling. Before the regression modeling, correlation analysis was conducted to identify the variables/factors that correlate highly with the dependent variable (the intent to achieve the

degree), but have lower inter-correlations with other independent variables. The method of forced entry was used for all five regressions models. In Model 1, social integration and school services (FAC2_3) was entered. In Model 2, demographic variables such as junior, college GPA (Q60) and gender were then added to Model 1. In Model 3, family background, such as family annual incomes (Q61), father's education-graduate studies (FED2) and mother's education-graduate studies (MED2) were entered. In Model 4, change of major-upper division (CHANGE2), timing of decision-lower college division (YEAR2) and timing of decision-upper college division (YEAR3) were then entered. In Model 5, majors with high correlation with the dependent variable such as engineering (MJR1), business (MJR2), health professions (MJR3), social sciences (MJR5) and computer science (MJR7) were last added. Table 17 displays the results of the five models.

Table 17. Regression Models for Intent To Achieve the Degree

Model/Variable		Mul. R	R	Adj. R	Added Adj. R	F	Sig. F	Beta	T	Sig. T
Model 1		0.174	0.039	0.02822	.028222	15.286	.0001***			
	FAC2_3							0.173761	0.391	.0001***
Model 2		0.283	0.089	0.07394	.045718	13.429	.0000***			
	FAC2_3							0.219712	4.921	.0000***
	JUNIOR							0.086143	1.933	.0538*
	Q60							0.166477	3.73	.0002***
Model 3		0.364	0.133	0.12033	.16672	10.804	.0000***			
	FAC2_3							0.234849	5.15	.0000***
	JUNIOR							0.095429	2.105	.0359*
	Q60							0.147225	3.213	.0014**
	FED2							0.070693	1.341	.1807
	MED2							0.03231	0.621	.535
	Q61							0.179455	3.741	.0002***
Model 4		0.386	0.149	0.13295	.01262	9.2226	.0000***			
	FAC2_3							0.216982	4.725	.0000***
	JUNIOR							0.09249	2.037	.0423*
	Q60							0.150273	3.299	.0011**
	FED2							0.05968	1.132	.2581
	MED2							0.036446	0.702	.4828
	Q61							0.178081	3.733	.0002***
	YEAR2							0.129529	2.664	.0080**
	YEAR3							0.000138	0.003	.9977
Model 5		0.478	0.228	0.20430	.07135	9.4731	.0000***			
	FAC2_3							0.149873	3.266	.0012**
	JUNIOR							0.103676	2.351	.0192*
	Q60							0.111614	2.5	.0128*
	FED2							0.043321	0.85	.3956
	MED2							0.018395	0.369	.7122
	Q61							0.139411	3.015	.0027**
	YEAR2							0.098673	2.048	.0412*
	YEAR3							-0.05579	-1.17	.2397
	MJR1							-0.18118	-3.67	.0003***
	MJR2							0.143211	2.863	.0044**
	MJR3							-0.16969	-3.46	.0006***
	MJR5							0.01147	0.216	.8292
	MJR7							0.034447	0.678	.4979

*** p < .001
** p < .01
* p< .05

Model 1 shows that social integration and school services (FAC2-3) is significant ($p<.001$), accounting for 3% association on the intent to achieve the degree (F11_1). Model 2 shows that additional two factors such as junior student status (JUNIOR) and college GPA (Q60) are also significant ($p<.001$). The two demographic variables have added additional 4% association to the equation. This may mean that college GPA (Q60) has added more effects on the intent to achieve the degree, given that the student status as a junior student is controlled.

In Model 3, family background is added to the equation. Family annual income (Q61) is significant ($p<.001$). However, father's education-graduate studies (FED2) and mother's education-graduate studies (MED2) are not significant. The Multiple R Square has increased to 0.36, which accounts for 13% of the total association. This model shows that with father's education, mother's education and student status (junior or senior) being controlled, social integration and school services, college GPA and family annual income are statistically significant in the effect on the student's intent to achieve the degree.

In Model 4, the timing of decision and change of majors are added to the equation. Decision- lower division is significant, which means that early college year decision making on majors may be associated with the student's intent to achieve the degree. The Multiple R Square in Model 4 is 0.35, which accounts for 12% of the total variance.

In Model 5, some majors with higher correlations are added to the equation. The Multiple R Square is 0.48, which is very significant ($p<.0001$). The Adjusted R Square has increased to 0.20 by 7%. Obviously, some majors themselves have more effects on the student's intention to achieve the degree than any other sets of variables. This finding is consistent with the previous finding that student's perceptions of labor market variables combined with personality orientation determine students' Choice of Majors, which , in turn, has much effect on the student's intent to achieve the degree. The final regression model discloses that with gender, race, GPA and parental education being controlled, engineering (MRJ1) has the largest absolute partial coefficient. With a negative sign, it means that students in engineering have the least intent to achieve the degree. The second important variable is social integration and school services (FAC2_3), which has a positive effect on the student's intent to achieve the degree. This

confirms the findings of the studies on student retention and attrition that academic integration and social integration in college life affect the student's decision to persist or drop out. Moreover, the present data analysis has generated a single factor that combines social integration and school services together, thus providing the important implication that student social integration is associated with school services in explaining the student's intent to achieve the degree. In addition, since family annual income (Q61) has a positive effect on the intent to achieve the degree, it may imply that middle income students are likely to persist and achieve their degrees due to family financial support. Moreover, juniors in this study are more likely to attain the degree than seniors. A crosstabulation of juniors' and seniors' perceptions of their perceptions of current labor market conditions shows a significant difference (Table 18).

Table 19. Crosstabulation of Student Status by "Current Market Is Good for My Major" (Q43)

STATUS JUNIOR OR SENIOR? by Q43 CURRENT MARKET IS GOOD FOR THE MAJOR

		Q43					
	Count / Row Pct / Col Pct / Tot Pct	STRONGLY DISAGREE 1	SOMEWHAT DISAGREE 2	NOT SURE 3	SOMEWHAT AGREE 4	STRONGLY AGREE 5	Row Total
STATUS							
	1	16	36	74	90	54	270
JUNIOR		5.9	13.3	27.4	33.3	20	49.5
		29.6	45.6	47.1	56.3	56.3	
		2.9	6.6	13.6	16.5	9.9	
	2	38	43	83	70	42	276
SENIOR		13.8	15.6	30.1	25.4	15.2	50.5
		70.4	54.4	52.9	43.8	43.8	
		7	7.9	15.2	12.8	7.7	
	Column Total	54	79	157	160	96	546
		9.9	14.5	28.8	29.3	17.6	100

Chi-Square	Value	DF	Significance
Pearson	14.0349	4	0.00718
Likelihood Ratio	14.31083	4	0.00637
	11.85694	1	0.00057

Minimum Expected Frequency - 26.703
Number of Missing Observations: 24

Students who made their choice decisions at the lower college division are likely to achieve their degree in time, since YEAR2 (the timing of decision-lower division) has a positive coefficient with the intent to achieve the degree. It may be explained that Choice of Major is associated with certain credit requirements for a particular degree. Those who made their decisions of majors earlier may have adequate time to meet credit requirements within the regular four years.

Students in business are more likely to achieve their degrees in four years, since business major (MJR2) has a positive correlation with the intent to achieve the degree. It is not

surprising that business is often regarded as a job-market-oriented major. 68% of the students in the business major in our survey thought that the current labor market was good for their majors and 67.8% students intended to achieve the degree and get a job as soon as possible.

In summary, with students' demographic characteristics, family background, and majors being controlled, social integration and school services (FAC2_3) has a significant effect on the intent to achieve the degree. Being a junior student has a strong relation with the intent to achieve the degree due to the fact that senior students are more concerned about the current labor market conditions than juniors. The family annual income of the middle class has a positive effect on the intent to achieve the degree. The engineering major (MJR1) has the largest negative effect on the intent to achieve the degree because of lower perceptions of job opportunities and more demanding course work. The business major has the largest positive coefficient in relation to the intent to achieve the degree. The health professions major (MJR3) has a weaker intent to achieve the degree. It is probably because a large proportion of students in the health professions have a higher value for people-oriented personality and job opportunity. Furthermore, in this study, 94% students in health professions, who are apt to change jobs or majors, were women. As some studies indicate, female students are more vulnerable to the labor market conditions than male students.

Descriptive analysis was used to test Hypothesis 5 that the students' campus experience offers relevant information for students' decisions on majors. In answering specific questions about the reasons of choosing a major (Q29 - Q48), students chose their majors primarily according to the information gained from their studies and course work. 67.4% of the students agreed with the statement that they gained information from course work and studies. This supports the hypothesis that college experience offers valuable information for Choice of Major. The descriptive analysis also demonstrates that a large proportion of students (35.6%) had the general knowledge about the labor market in selecting their choices of majors (Q39). Most students did not seek professional help such as high school counseling (Q32 and Q33) and college counseling (Q34, Q35 and Q36). However, some students sought help from professors (15.4% in Q36) and recruitment materials (17.6% in Q37) in making their Choice of Majors.

Still, about 25% of the students reported that good advisement of the program helped them to choose their majors (Q29). All in all, college experience truly plays an important role in facilitating the student's choice of major. Once again, it is clear that Choice of Major is closely related to students' career development, especially to some values that can be gained from their future jobs. It may be concluded that Student Choice of Major is, in general, a product of the combination of the students' perceptions of labor market variables/conditions and personality orientation, which are facilitated and enhanced by college experience.

In testing Hypothesis 6, descriptive analysis also discloses that about 50% of the students made their decisions in the lower college division and a large proportion of students made their choices of major in the college sophomore year. Only a small percentage of students made their choices in the upper division of college (10.6%). Finally, this study also shows that most students change their majors at least once in the full-time four-year college studies.

Discussions

The findings of the data analyses in this study have demonstrated the importance of students' perceptions of labor market conditions/variables and students' personality orientations in their choice of academic majors. Students with similar perceptions of labor market variables and personality orientation seem to flock together in their choices of majors. In a sense, Choice of Major appears to be not only a mater of personal or individual preferences, but also a phenomenon of sociological and psychological group behaviors in career development. This implies that Choice of Major should not be regarded as a strictly personal matter. Research attention should be turned to Choice of Major as a social behavior formulated and reacted in a social and psychological environment. As Student Choice of Major is a very important part of career development, helping students make the best choice or a better choice will promote success in their educational investment and career development. Therefore, timely and effective professional help in student career development should be carefully planned, implemented and evaluated. A view of student career choice as a group or social behavior may facilitate effectiveness and efficiency in the process of student development and environment improvement

without loosing the vision of treating the student as a unique individual.

The student's intent to achieve the degree may be closely related to degree attainment. Enhancing the intent to achieve the degree may improve student retention. As Choice of Major is mainly a subjective matter, to increase self awareness of personal goals, values, and personality orientation and facilitate favorable environmental factors in student development are essential elements to promote the intent to achieve the degree and thus retention. This may also increase the pace of the decision making process of Choice of Major. Therefore, facilitating students' self-awareness of their personality orientation, goals, values and career development is a moral responsibility of the institution. For the desired change of self-awareness, institutions must identify the features of their student profile, institutional attributes and favorable environmental factors that may affect such changes.

It is imperative to notice the importance of Student Choice of Major as a link between individual career development and social economic development for the society. Being regarded as both consumption and investment, higher education plays a critical role in fulfilling the social demand and individual needs through human capital investment. It is believed that human capital investment aims at increasing employability and personality development as well as lifetime incomes. As Hossler (1978:25) puts forth, "The facts still indicate that higher education exerts a positive influence on employability." This requires of administrators and researchers new tasks to investigate the trends of labor market conditions and its relations with the enrollment and retention. It is well advised to have both students and administrators know which majors are vulnerable to market changes with the research findings on the trend of the labor market. For this purposes, enrollment management should be a team work where all function offices should work collaboratively with effective communication. For example, career services should provide adequate information about the trends of labor market conditions and job employability of each major to help students make better choices. Both career and academic counselors should get to know and understand students' personality orientation and education aspirations either through surveys or individual counseling. The office of financial aid should obtain and provide information about the student cohort's ability to pay for higher education so that federal and

state aid can be best targeted and allocated to help needy students with best choice of majors. Faculty should be aware of the important roles they play in assisting students in making a choice of major and promoting student retention. If faculty, in and out of the classroom, can relate their subject matter to student career development or provide relevant information about the prospects of the new skills and technology needed in the labor market, the effect of such influence upon the student's choice of major and student retention will be invaluable.

This study also shows that students in different majors have different perceptions of labor market variables and different personality development, which prescribe a different niche of academic environment for each academic group of students. Administrators and faculty may wish to reinforce the coherence of a subculture to attract and retain students who may well fit and can be satisfied with the environment. Carefully selecting and channeling students into the right major may result in better student-institution fit and better retention rates.

Although Choice of Major is typically a mater of perceptions of labor market conditions and variables and personality orientation shown in this study, with financial ability, family education and ethnicity being controlled, male and female students have different perceptions of labor market variables. Female students cherish more the values of job opportunities and male students pursue the higher values of salaries and benefits. In this sense, departments and programs that plan to enlarge the enrollment of female students should design and develop programs that may offer a wider variety of job opportunities for women.

In conclusion, the findings of this study may broaden our view of enrollment management and student retention in the aspect of Student Choice of Major and career development. Although the generalization of this study is limited by its cross-sectional method, regional constraints and the type of students and instituion, this study has defined several important factors that affect students' choice of majors and established a model for futher studies. Futher studies on multiple campuses, different types of students and institutions are needed to confirm the findings of this study. Evidently, students' subjective desires and efforts integrated with a favorable environment can be d etermining factors for their success in college studies.

*** End ***

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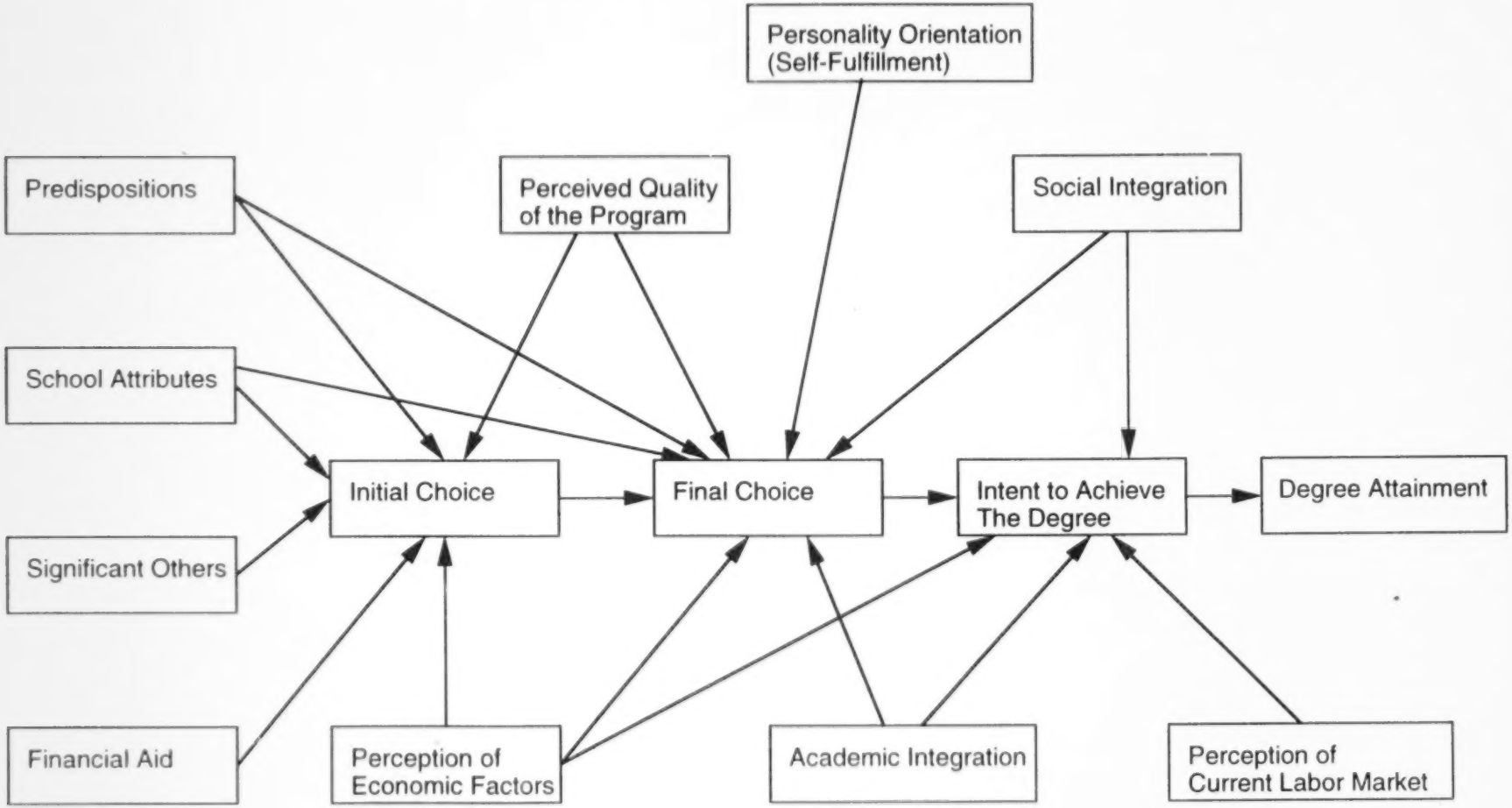


Fig. 1 A Model of College Student Choice of Academic Major

Trends of Bachelor's Degree Recipients' Average Annual Salaries
Selected Majors - One Year after Graduation
The United States

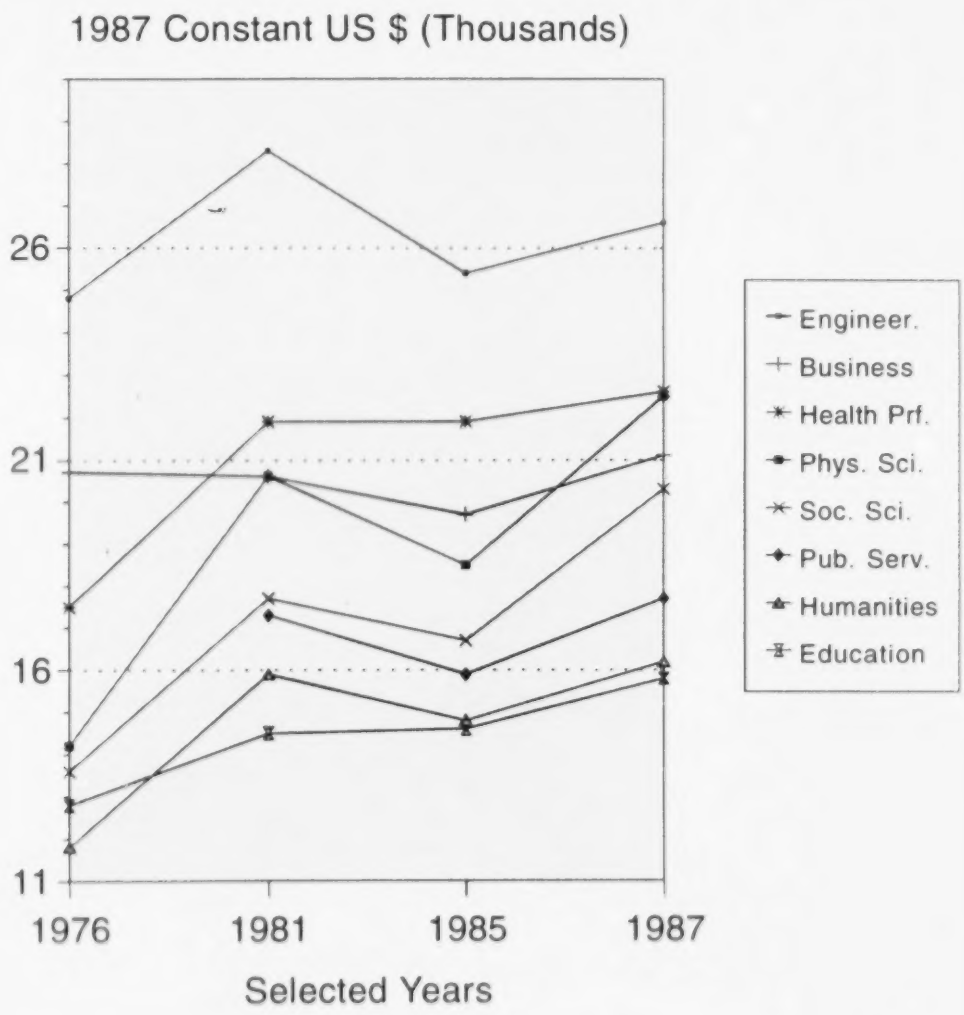


Fig. 2 The United States: Average Annual Salaries of Bachelor's Degree Recipients
Source: Statistic Abstract of the United States 1991

New York State Enrollment Trend
Upper Divisions: Juniors and Seniors
Selected Disciplines

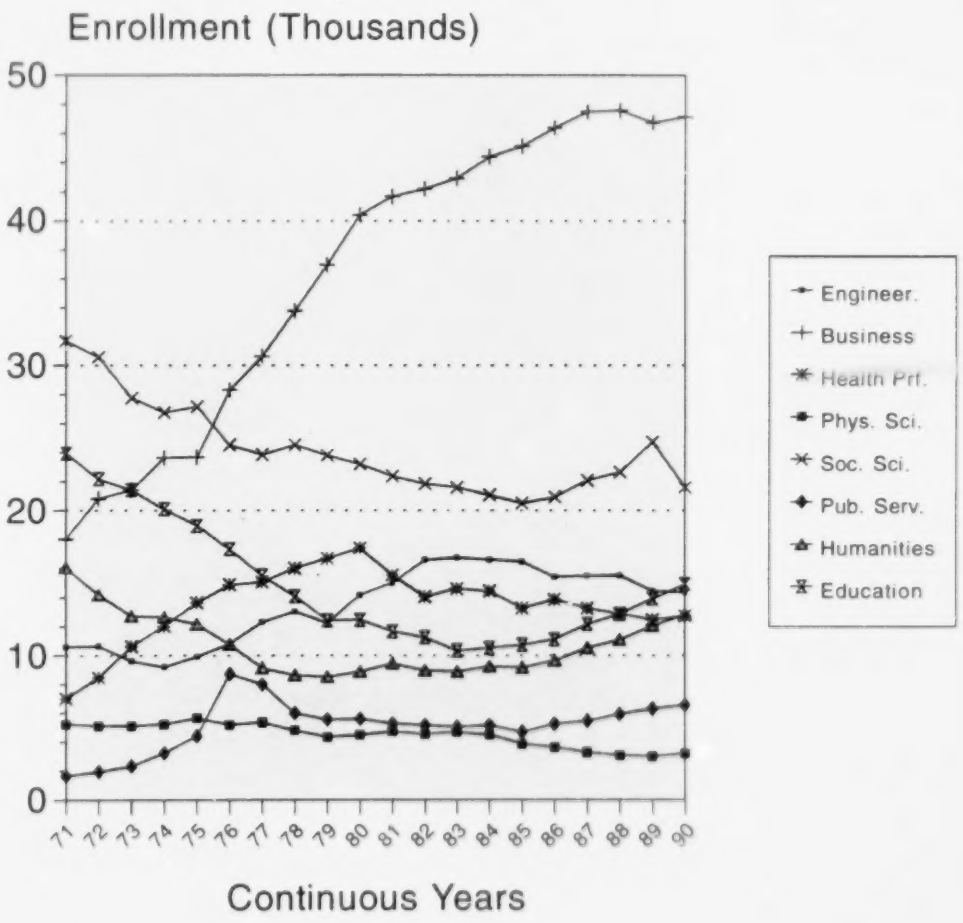


Fig. 3 New York State Enrollment Trend Upper Divisions of Juniors & Seniors
Source: New York State Education Department, Office of Postsecondary Policy Analysis

New York State Bachelor's Degrees Conferred
Selected Disciplines

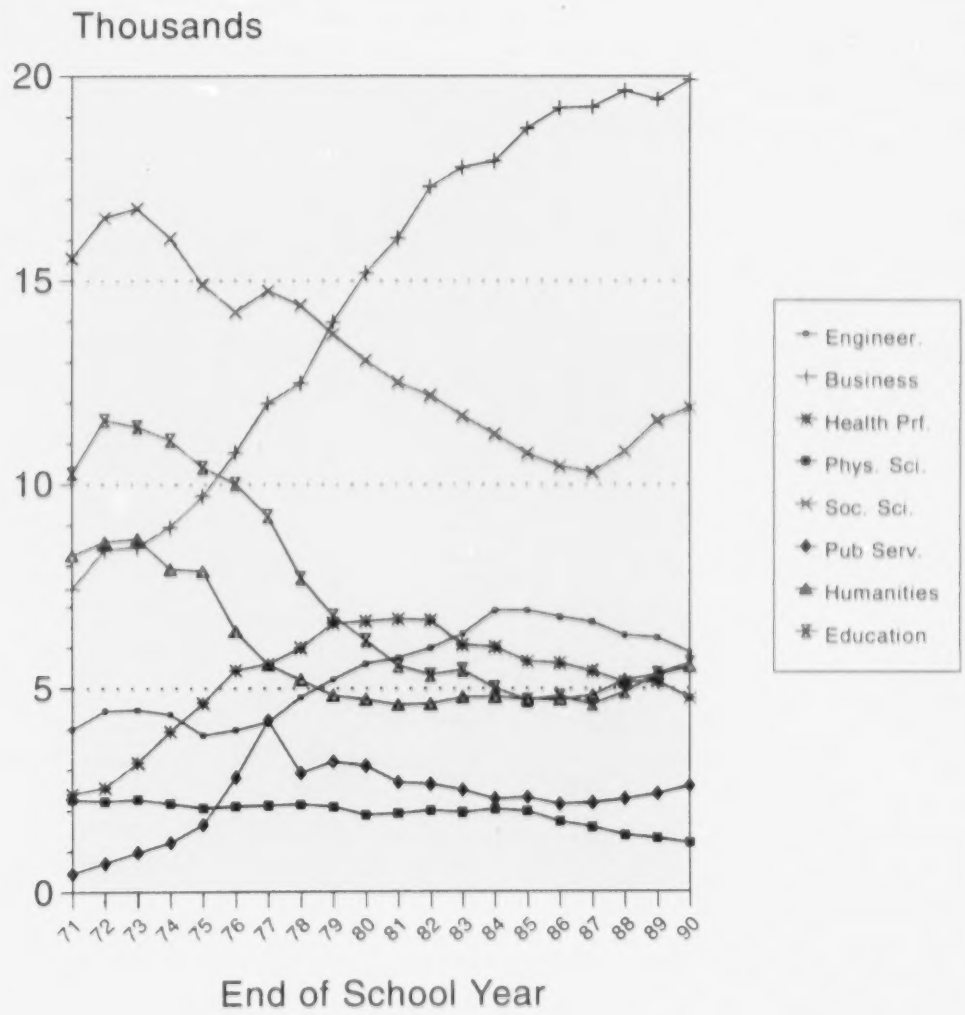


Fig. 4 New York State Bachelor's Degrees Conferred by Disciplines
Source: New York State Education Department, The Information Center on Education

The United States Bachelor's Degrees Conferred
Selected Disciplines

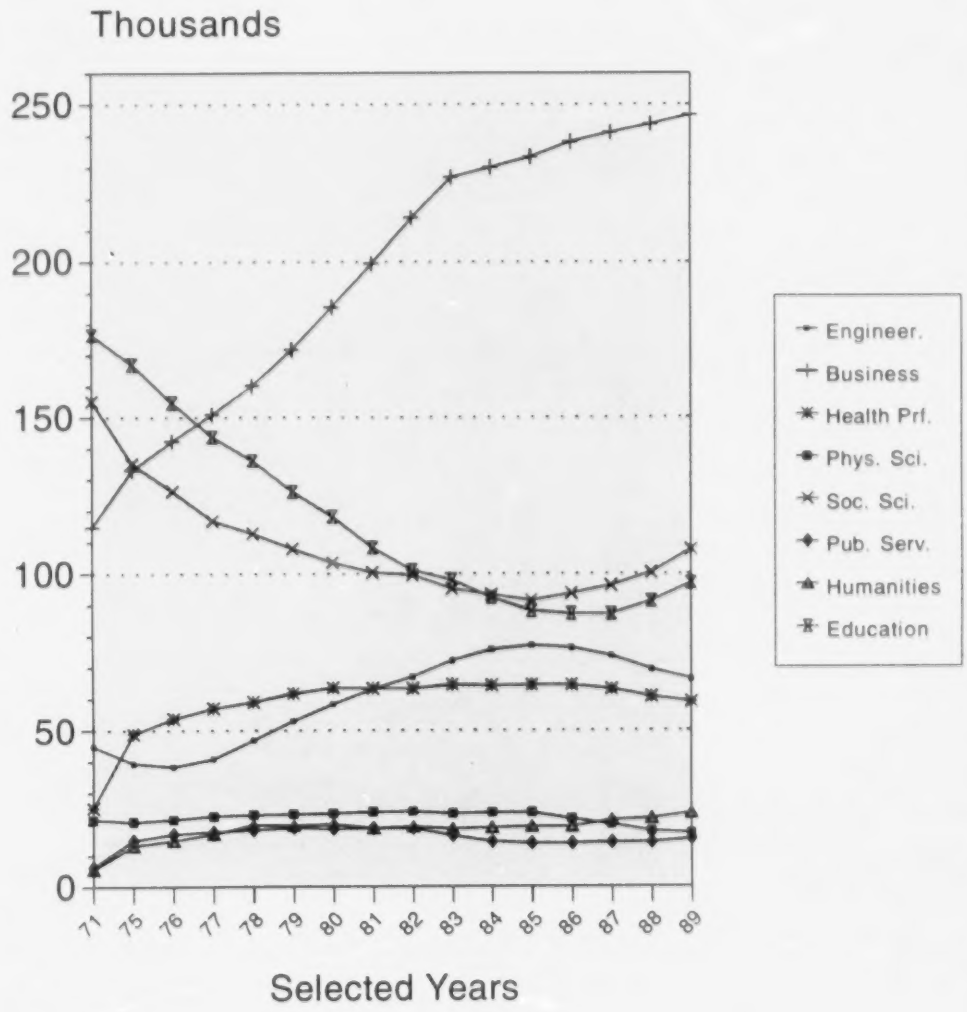
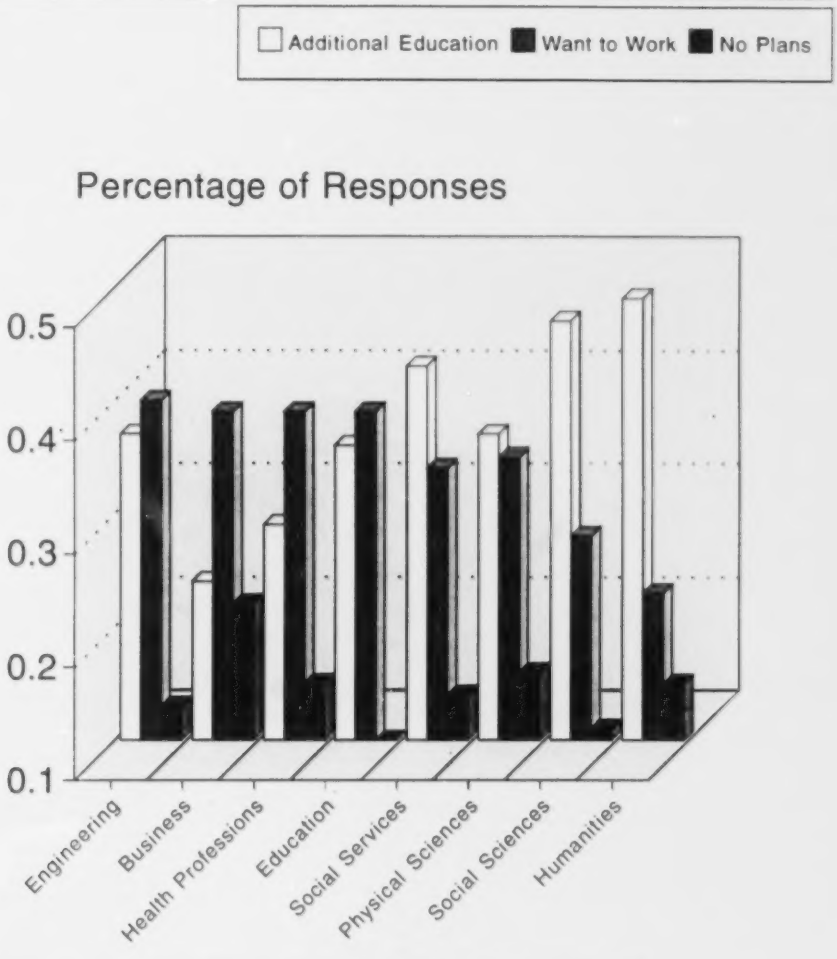


Fig. 5 The United States Bachelor's Degrees Conferred by Disciplines
Source: Statistic Abstract of the United States 1991

1985-86 Bachelor's Degree Recipients Opinions about Work/Additional Education
National Survey in the United States



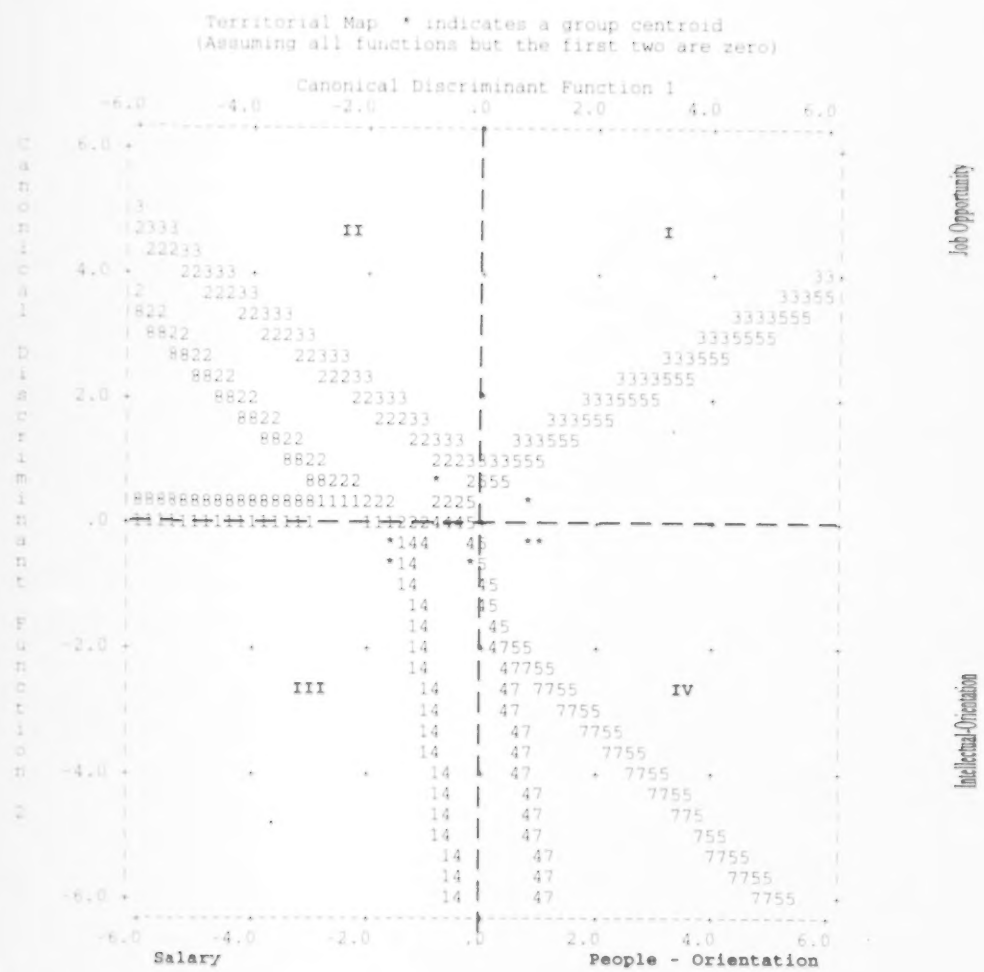
Additional Education	0.37	0.24	0.29	0.36	0.43	0.37	0.47	0.49
Want to Work	0.4	0.39	0.39	0.39	0.34	0.35	0.28	0.23
No Plans	0.13	0.22	0.15	0.1	0.14	0.16	0.11	0.15

Fig. 6: The United States: 1985-86 Bachelor's Degree Recipients' opinions about Work/Study
Source: Statistic Abstract of The U.S. 1991

Fig. 7. A Model of Choice of Different Majors

Symbols used in territorial map

Symbol	Group	Label
1	1	ENGINEERING
2	2	BUSINESS
3	3	HEALTH PROF
4	4	PHYSICAL SCI
5	5	SOCIAL SCI
6	6	PUBLIC SERVICES
7	7	HUMANITIES
8	8	COMPUTER
*	Group centroids	



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